4.3. DOMINANT PLANT AND ANIMAL SPECIES IN AQUATIC BIOTOPES OF KOVILJSKI RIT MARSH AREA (VOIVODINA, YUGOSLAVIA)

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4.3.1. INTRODUCTION

Unlike other cities, in the vicinity of Novi Sad aquatic habitats like marshes, pools, backwaters, and even those closely related to water regimen (river islands) are found. They are refuges and maybe last oases for many rare plants and animals. In past, natural aquatic ecosystems showing a powerful biological diversity were widespread in the plains of Voivodina. In the response to the impact of humans however, they are in most part destroyed or degraded following changes in ecological conditions, disturbed biocoenotyc relationships, and the ecological balance in general. Consequently, many plant and animal species are extinct in their natural habitats, some withdrawn, or under the threat of extincion. Taking into consideration the fact that the Novi Sad region in last year was exposed to harmful effects like crude oil flowing off, combustion of oil derivates, sulfur compounds, canceregenous and other harmful substances, the living conditions have become worse. The main aim of these investigations was to establish a present status of plant and animal compositions in aquatic ecosistems of the region of the Novi Sad city and its surroundings, i.e. to recognize possible consequences and changes of the biological component affected by war destruction. Investigation were aimed at Koviljski rit Marsh taking into consideration its considerable endangereness with substances after the oil rafinery was destroyed.

Koviljski Rit Marsh is situated on the left bank of the Danube (between 1230 and 1249 river km) downstream of Novi Sad. In 1998, this 4860 ha area of an extraordinary importance legislatively became a special natural reservation. In addition, it is registered among the internationally important European bird regions (IBA). It has also been put on a list of marshes, candidates for a list of regions of the internationally recognized importance (Ramsar convencion, 1971)

4.3.2. MATERIAL AND METHODS

The investigations were carried out in the period June-December of 1999. Determination and nomenclature of plant taxa were done according to Flora SR Srbije (Josifovic 1970-1977; Saric and Diclic 1986), Iconographia Florae Partis Austro-Orientalis Europae Centralis (Javorka and Csapody 1975) and Felföldy (1990).

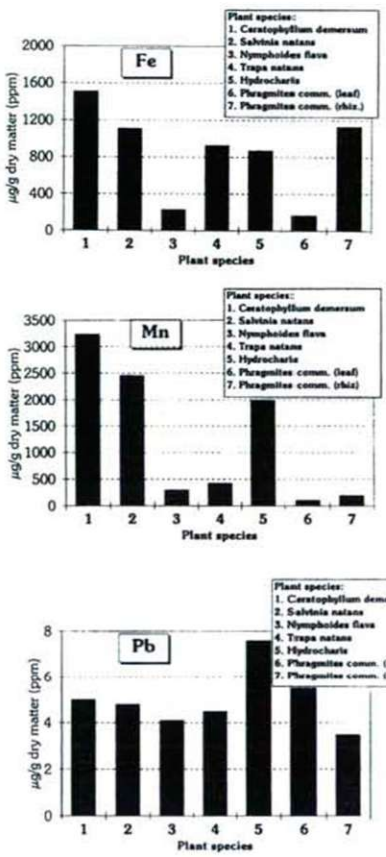
The total metal concentrations were determined by atomic absorption spectrophotometry.

At the area of Koviljski rit marsh 28 specimens of green frogs were cought by random sample principe. Collected material was used for parasitological and food composition, investigations of this species.

To analyze qualitative and quantitative fish fauna composition electrofishing at moderate water level was employed. Body mass, total and standard body length, and sex and age determination were performed (Cugunova, 1959).

4.3.3. Results and Discussion

When qualitative floristic structure is discussed plant investigation results show that aquatic habitats of Koviljski Rit Marsh area are still preserved, i.e. a great diversity of plant species occur. More than fifty species of vascular macrophytes have been recorded. The greatest abundance was established in: *Ceratophyllum demersum* L., *Myriophyllum spicatum* L., *Nymphaea alba* L., *Nuphar luteum* (L)Sm, *Nymphoides flava* Hill., *Salvinia natans* (L) All., *Azolla caroliniana, Spirodela polyrrhiza* L., *Lemna minor* L., *Lemna gibba* L., *Hydrocharis morsus ranae* L., *Trapa longicarpa* Jank., *Potamogeton crispus* L., *Potamogeton lucens* L., *Potamogeton perfoliatus* L , *Phragmites communis* Trin., *Iris pseudacorus* L. and *Butomus umbellatus* L..



	Water µg ml^{-1}	Mud µg g^{-1}
Fe	0.73	16154
Mn	<0.03	496.0
Pb	<0.04	29.6
Cd	<0.05	0.6

Fig. 1. Concentration of Fe, Mn and Pb in some macrophytes of the Koviljki rit. Concentration of Cd <0.5µg/g dry matter.

To determine heavy metal pollution in samples of six indicator plant species, concentration of micronutrients (Fe and Mn) and polutants (Pb and Cd) was analyzed. An extremely high Fe (up to 1600 μ/g dry mass) due to chemical composition of sediments was obtained. A submersed *C. demersum* showed the highest bioaccumulation rate while pollution was not indicated by tissue Pb and Cd. High values of mud Fe and Mn were evident (Fig. 1).

Changes of ecological conditions in an environment may also be indicated by the presence of certain fish species and tailless amphibians together with their parasites. Koviljski Rit Marsh area is dominated by edible frog (*Rana "kl". esculenta*). Stomach content analyses of *Rana lessonae* and *R. "kl". esculenta* show the presence of insects (87%), snails (8.7%), and araneids (4.3%). In addition, the four fluke and four nematode species among which *Diplodiscus subclavatus, Cosmocerca ornata*, and *Aplectana acuminata* dominated were observed (Tables 1 and 2).

Table 1. Fluke infestation extensity of Rana hosts

TREMATODA SPECIES	α							
	Hosts		Trematodes		Hosts		Trematodes	
	N°	%	N°	%	N°	%	N°	%
Haematoloechus schulzei	1	11.11	1	1.89				
H. variegatus dubininae					1	25	1	5.88
Haematoloechus sp.					1	25	1	5.88
Opisthioglyphe ranae	1	11.11	2	3.77	1	25	3	17.65
Diplodiscus subclavatus	7	77.78	50	94.34	3	75	12	70.59
S			53				17	

Table 2. Nematode infestation extensity and percentages in Rana hosts

Organon	Nematoda species	N° of hosts	Ext. inf. (%)	N° of nematodes	% of S nematodes
Pulmo	***Rhabdias bufonis***	3	16.67	4	2.22
Int.	***Oswaldocruzia filiformis***	1	5.55	7	3.89
	Cosmocerca ornata	3	16.67	9	5.00
	Aplectana acuminata	2	11.11	5	2.77
Rectum	***Cosmocerca ornata***	8	44.44	110	61.11
	Aplectana acuminata	9	50.00	43	23.89
V. urin.	***Cosmocerca ornata***	1	5.55	2	1.11
S		18	64.28	180	

The fish fauna included twelve fish species in five families (Table 4), three allochthonous and the remaining autochthonous fishes. With eight observed species the abundance of Cyprinidae was evident. The highest percentages were obtained with *Rutilus rutilus*, then *Lepomis gibossus* while in total mass an introduced species *Carassius auratus gibelio* diminated. Economically important fish species were rare since only very small percentages of *Cyprinus carpio* and *Esox lucius* were recorded. Fish age was between 1+ and 4+. In summary, Koviljski Rit Marsh waters belong to II class.

Research results only show the present status of the ecosystem conditions. Further complex hydrobiological investigations showing a more clear picture of this and other valuable natural aquatic resources surrounding Novi Sad are need.

Table 3. Fish fauna composition

FAMILY AND FISH SPECIES	% OF TOTAL INDIVIDUAL NUMBER
Fam. Cyprinidae	
Cyprinus carpio L.	0.47
Blicca bjoerkna L.	0.93
Aspius aspius L.	0.93
Carassius auratus gibelio Bloch	17.76
Scardinius erytrophthalmus L.	11.68
Rutilus rutilus L.	42.99
Alburnus alburnus L.	1.40
Leuciscus cephalus L.	1.40
Fam. Esocidae	
Esox lucius L.	0.47
Fam. Percidae	
Perca fluviatilis L.	0.47
Fam. Centrarchidae	
Lepomis gibbosus L.	20.09
Fam. Ictaluridae	
Ictalurus nebulosus Le Sueur	1.40
NUMBER OF FAMILIES	5
NUMBER OF FISH SPECIES	12
NUMBER OF SPECIMENTS	214

4.3.4. SUMMARY

The paper is a contribution to a complex hydrobiological investigations into the Koviljski Rit Marsh area covering a flood zone of middle Danube (between 1230 and 1249 river stream km) .

A relatively great species diversity of this area is correlated with plant world inhabiting aquatic biotopes. Over fifty species of vascular macrophytes have been recorded. Among them, a considerable number of Tertiary relict, rare, and endangered plants occur. In addition, dominance of Rana species was studied. Stomach content analysis of showed the occurrence of insects (87%), snails (8.7%), and araneids (4.3%) while in helminthological investigations four fluke and four nematode species were recorded. Fish fauna includes twelve species in five families with most abundant Cyprinidae representatives.

4.3.5. REFERENCES

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